

## NUTRITION

- Nursery pigs that received animal-based protein sources (versus plant-based protein sources) had improved performance during a subsequent Salmonella challenge.
- Functional amino acids (FAA) (methionine, threonine, tryptophan) at 120% of requirements partially mitigated the negative effects of nursery diets containing only plant-based proteins.
- Low birth weight pigs are more susceptible to a Salmonella challenge compared to normal birth weight pigs.
- FAA supplementation was effective at improving growth performance in normal birth weight pigs, but not low birth weight pigs, during a subsequent Salmonella challenge.
- Diets formulated to meet essential amino acid requirements but to be low in total dietary nitrogen (as indicated by an essential amino acid-nitrogen:total dietary nitrogen [EAAN:TN] ratio of 0.55) are limiting in total nitrogen for protein retention, resulting in a reduced lysine requirement.
- No lysine breakpoint was established in diets formulated to meet essential amino acid requirements and with an EAAN:TN ratio of 0.48, indicating sufficient amounts of both essential amino acids and total dietary nitrogen were supplied. The EAA:TN ratio may be an indication of nitrogen sufficiency in swine diets.
- Maintenance requirements for lysine was higher in pigs fed a diet with EAAN:TN of 0.55 vs. 0.48, indicating greater use of lysine for functions other than nitrogen retention.
- An increase in dietary lysine content improved growth performance of grower pigs, regardless of EAAN:TN.
- There was a trend for reduced nitrogen output with higher lysine content (1.22 % SID) and lower EAAN:TN ratio (0.48). This indicates improved nitrogen use in diets formulated to meet total dietary nitrogen requirements.
- Feeding sows in the morning (7 am) pre-farrowing resulted in an increase in the frequency of farrowing during the day (7 am to 3 pm) compared evening feedings (7 pm). There was no effect of timing of feeding on frequency of farrowings completed during the day or on farrowing duration.
- Growing pigs fed diets containing 40% air classified pea starch had comparable growth, increased feed intake, and reduced feed efficiency compared to wheat-based diets.
- Feed outages up to 24 hours had no overall impact on growth or feed intake of finishing pigs in a "controlled, low-stress" environment.
- The majority of pigs (> 90%) fed diets with 40% air classified pea starch had evidence of gastric ulcers at slaughter. This was aggravated by a 16 hour feed outage 2 weeks prior to slaughter, and did not appear to affect performance.
- The inclusion of 4 ppm ergot alkaloids in the diet of growing pigs significantly reduces feed intake and growth.
- Adding 40% field peas to grower diets increased CH<sub>4</sub> and CO<sub>2</sub> emissions (kg CO<sub>2</sub> equivalents kg pig<sup>-1</sup> d<sup>-1</sup>) by approximately 20%.
- Adding a multicarbohydase enzyme to grower diet reduced CH<sub>4</sub> and CO<sub>2</sub> emissions (kg CO<sub>2</sub> equivalents kg pig<sup>-1</sup> d<sup>-1</sup>) by approximately 26%.
- The global warming potential associated with crop production required for feed ingredients for 100 grower pigs decreases by approximately 14% with the inclusion of 40% field peas in the diet.



# ETHOLOGY

- During the summer pigs undergoing short transport (<2 hrs) showed a higher cortisol response indicating acute stress, while pigs that underwent long transport (>30 hrs) showed signs of mild dehydration and weight loss. There were no clear indications that long transport had severe or long-lasting negative consequences for piglet health.
- Weaning results in an acute and prolonged rise in blood cortisol levels (remaining significantly higher than in unweaned controls up to 72 hrs after weaning). There was no indication that weaning and transport stress are additive, as transported piglets (both long and short) had lower cortisol levels after transport than did weaned piglets. Results indicate that transport has a mitigating effect on weaning stress.
- Infrared cameras used to record temperatures (body and ocular regions) of 120 market pigs before and after transport to a packing plant indicate a significant positive correlation between pigs' ocular temperature and blood cortisol levels at slaughter.
- Body temperature was a better predictor of meat quality than ocular temperature. Pigs that produced PSE or moderate PSE loins had significantly higher body temperatures (measured in lairage) than pigs that produced RFN (normal) meat quality.
- Canadian sow herds shows average death losses of 6%, which is moderate compared to averages reported in other countries. Sow mortality tends to be higher in larger herds and in farms managing sows in groups rather than in stalls.
- Providing a rotation of inedible point-source enrichments increased the level of interaction with enrichments compared to a single chain, but showed no benefit influencing the response of pigs to a natural disease challenge, as measured through growth, feed efficiency, and mortality.
- Preliminary data on behaviours of individual pigs reared with and without a rotation of point-source enrichment indicates that pigs reared with enrichment displayed greater levels of oral-nasal-facial behaviours. This suggests enrichment increases stimulating exploratory behaviour, resulting in redirected behaviour towards pen-mates.
- Individual pig behaviour during a disease challenge identified the performance of pen rooting (during disease challenge) was associated with increased average daily gain in the finisher period and higher immune cells. This may suggest pigs that are more active and showing functional behaviours during challenge may be associated with a good recovery from disease.



ONTARIO PORK

# ENGINEERING

- A magnetized activated carbon (MAC) using ultrasonic-assisted co-precipitation of iron oxide nanoparticles ( $\gamma$ -Fe<sub>2</sub>O<sub>3</sub>) was developed for the removal of antibiotics and facilitate separation of spent adsorbent from the treated water. The superparamagnetic properties of the adsorbent allowed a separation efficiency of  $95 \pm 3\%$  from water, while magnetization changed the physiochemical properties of activated carbon.
- The adsorbent (MAC) was used for tetracycline (TC) from water at various concentrations and temperatures, and for simultaneous adsorption of TC and lincomycin (LM). The adsorption capacities of MAC toward TC either as an individual or in the presence of LM in water were slightly lower than that of AC. In a mixture TC and LM, TC was preferably adsorbed by a factor of 4.3 times.
- Engineered water nanostructures (EWNS) were tested for effectiveness in reducing livestock particulate matter (PM). The highest reduction efficiency obtained for PM15.0 was 75% for pig barn PM.
- Carbohydrase enzyme had minimal effects on parameters measured, regardless of wheat millrun inclusion ( $P > 0.10$ ). Although energy, N and P digestibility, and ADG were reduced, the inclusion of up to 30% wheat millrun in the diet has no effect on GHG emissions from growing pigs ( $P > 0.10$ ).
- Slightly acidic electrolyzed water (SAEW) and peracetic acid (PAA) disinfection strategies were evaluated in different rooms, and the microbial load from various surfaces was assessed. Results showed that PAA (400 ppm) and SAEW (50 ppm) were more effective than conventional disinfectants (VIRKON) in nursery rooms 4 to 24 hours after application, while their effectiveness in grow-finish and farrowing rooms was comparable to VIRKON.
- All treatments showed reduced efficacy on concrete, indicating that a longer contact time is recommended for rough surfaces. Economic analysis demonstrated that SAEW reduces the cost of disinfectant used per pig by about 20 to 26%, while an increase of 0.04-0.21 cents/pig for PAA.
- Whole genome sequencing (WGS) analyses revealed that RWA barns had reduced the frequency of AMR genes in piglet feces and in-barn manure. However, metagenomic analyses showed that RWA barns had a significant increase in the frequency of pathogenic Firmicutes in fecal samples and pathogenic Proteobacteria in barn manure samples.

For more information, please contact  
**Prairie Swine Centre**

Box 21057, 2105 8th Street East  
Saskatoon, Saskatchewan CANADA S7H 5N9  
Phone: (306) 373-9922 - Fax: (306) 955-2510  
[www.prairieswine.com](http://www.prairieswine.com)



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